International Journal of Science Engineering and Advance Technology, IJSEAT, Vol. 5, Issue 3 | ISSN 2321-6905 March -2017

International Journal of Science Engineering and Advance Technology

An Explorative Study On Quarry Dust Blended Geo Polymer Concrete For Various Concentrations Of Alkaline Activated Solution

Cheveti Prathyusha[1], M. Richard Ford[2]
[1]M.Tech: Structural Engineering Student, Lingayas Institute of Management and Technology, Madalavarigudem, Vijayawada, A.P., India.
[2]Assistant Professor, Dept. of Civil Engineering, Lingayas Institute of Management and Technology, Madalavarigudem, Vijayawada, A.P., India.

Abstract — Cement is the most generally utilized development material on the planet and Ordinary Portland Cement (OPC) is the real fixing utilized as a part of cement. The generation of bond discharges huge measure of carbon dioxide (CO2) to the climate that altogether adds to ozone harming substance emanations. It is evaluated that one ton of CO2 is discharged into the environment for each ton of OPC created. This venture for the most part goes for the investigation of impact of grouping of soluble actuated arrangement on the properties of geo polymer concrete (GPC) with the supplanting of fine total with quarry clean utilizing sodium silicate (Na2SiO3) and sodium hydroxide (NaOH) arrangements as antacid activator. The supplanting of sand with quarry clean in GPC blend upgraded the mechanical properties at surrounding room temperature curing at all ages. The Geo-polymers are contained alumina-silicate materials which totally replaces the Portland bond in cement. The alumina-silicate materials which are broken down in soluble actuated arrangement i.e., Sodium Hydroxide or Potassium Hydroxide which along these lines polymerizes into sub-atomic ties and systems to make the solidified folio which are alluded as inorganic polymer concretes. The fundamental target of this venture is to examine the compressive qualities for different centralizations of antacid actuated arrangement with the substitution of stream sand by quarry clean. The Mix outline technique is inspected with M-20 review of geo polymer concrete. The compressive quality and workability of the solid are examined for different evaluations of the Geo-polymer concrete.

Keywords — *Geo-Polymer Binder, Fine Aggregate (Quarry Dust), Coarse Aggregate and Water.*

I. INTRODUCTION

Using modern by-items has expected significance in the field of research, recently. Endeavors are now in progress everywhere throughout the world, to create condition cordial development materials, which help in decreasing ozone depleting substance emanations from concrete industry. In this unique situation, Geo polymer concrete (GPC) is another class of building material that has risen as an other option to Ordinary Portland Cement (OPC) concrete and has the possibility to upset the building development industry. Analysts have fundamentally analyzed the different parts of its practicality as folio framework. GPC is created from fly fiery debris blended with soluble activators of Sodium Hydroxide and Sodium Silicate arrangements of particular molar fixation. High range water lessening admixtures are utilized for creating adequate workability. The goal of the present work is, to concentrate the impact of Supplementary Cementitious Materials (SCM) in fly slag based Geopolymer concrete, at room temperature curing. The present work manages the advancement of Ground Granulated Blast Furnace Slag (GGBS) based GPC. Trial blends were completed and results were contrasted and the ostensible blend. Workability properties of crisp cement were measured and mechanical properties were evaluated for 7 and 28 days. Flexural quality properties were surveyed for the Reinforced GPC and OPC solid bars. Pillars were planned considering an adjusted area for the normal trademark quality.

Geo-polymer binder:

The reaction of Fly Ash with an aqueous solution containing Sodium Hydroxide and Sodium Silicate in their mass ratio, results in a material with three dimensional polymeric chain and ring structure consisting of Si-O-Al-O bonds. This material is called as Geo-polymer binder.

Parameters considered:

Low calcium class F (ASTM CLASS F) fly ash is used.
Solution to fly ash ratio=0.35.
Sodium hydroxide to sodium silicate ratio=1:2.5
The concentrations of alkaline activator solution used are 4M, 6M, 8M, 10M, 12M, and 14M.
For every 1M solution we have 40gms of NaoH dissolves in 1000ml of water.

Fine aggregate (River sand replaces with quarry dust):

The total which is going through 4.75 mm strainer is known as fine total.

It is for the most part observed that stream sands are quick vanishing from waterway beds due to over abuse. This has prompted a progression of research endeavors and soon enough with a substitute that served similarly well and much superior to anything the stream sand.

Quarry clean was utilized as substitution of fine total. Quarry tidy is a result of squashed stone; here the stones are smashed into littler granular size of stream sand granules.

The accompanying table speaks to the properties of quarry tidy.

Coarse aggregate:

The particles which are greater than 4.75mm are considered as coarse aggregates. We are using 12.5mm size of aggregates.

The following table represents the properties of coarse aggregates.

Properties	***Observations***
Fineness modulus	*6.83*
Specific gravity	*2.61*
Bulk density	*1530 kg/m^3*

Water:
Water is not involved in the chemical reaction of geo polymer concrete and instead water is expelled during curing and subsequent drying. Only water can be used in preparation of alkaline activator solutions.

II. LITERATURE SURVEY

[1] P. Chindaprasirt et.al (2011) They concentrated the union of high-quality Geopolymer utilizing fine high-Calcium fly slag. The outcomes demonstrate that the setting time of glue, abatements with an expansion in fly-fiery remains fineness. The stream quality, and drying-shrinkage attributes of mortars enhanced utilizing fine fly powder. Geopolymer mortars with high 28-day compressive quality of 86.0 MPa were acquired.

[2] Partha, Prabir and Pradip [2014] researched that when the GGBS was included the scope of 0 - 20% of aggregate cover, critical increment in quality and some lessening in workability was seen in Geopolymer concrete. The expansion of GGBFS improved the setting of cement at encompassing temperature. The impact of blend factors on the improvement of elasticity was like that on the advancement of compressive quality.

[3] Sunil Kumar.R, Dr V.Ramesh(2015) 18 sorts of blends of Geopolymer Concrete were set up for three diverse water to Geopolymer solids, for two distinctive folio extents of 375 kg/m3 and 420 kg/m3 by keeping the Molarities steady (soluble base arrangement 8M), ideal fck was chosen to cast the plain Geo polymer solid bar example and chambers. As detailed 35% GGBS (65% fly slag), in the aggregate cover content brought about the early quality advancement of geo polymer concrete under SUN DRYING which demonstrated better quality properties.

Properties	***Observations***
Fineness modulus	*2.95*
Specific gravity	*2.7*
Bulk density	*1750kg/m^3*

[4] V Supraja, M. Kanta Rao (2012) in this paper an endeavor was made to create the Geopolymer concrete, completely supplanted with GGBS and basic fluids which were utilized as restricting materials. Diverse molarities of Sodium Hydroxide arrangement i.e. 3M, 5M, and 7M and 9M was taken to get ready distinctive blends. Two distinctive curing were completed i.e. stove curing at 500 c and curing specifically by setting the examples under direct daylight. Creators watched that the compressive quality expanded with an expansion in the molarity of Sodium Hydroxide and daylight curing is advantageous for commonsense conditions.

[5] V. Eswaraiah, G. NageshKumar(2014) completed investigation and plan of recorn 3s-polypropylene strands in GPC under hot air broiler curing temperature of 600C for 24 hours. They watched less shrinkage and water assimilation property when contrasted and conventional Portland concrete.

[6] Mr. Gautam L et.al(2015) A fruitful improvement of fly fiery debris based and fly powder and GGBS based Geopolymer cements with low Molarity is accomplished. Twenty distinctive blends utilizing NaOH arrangements of Molarities 3, 4, 5 and 6 were chosen.

The W/B proportion is seen to significantly affect the quality figured it out

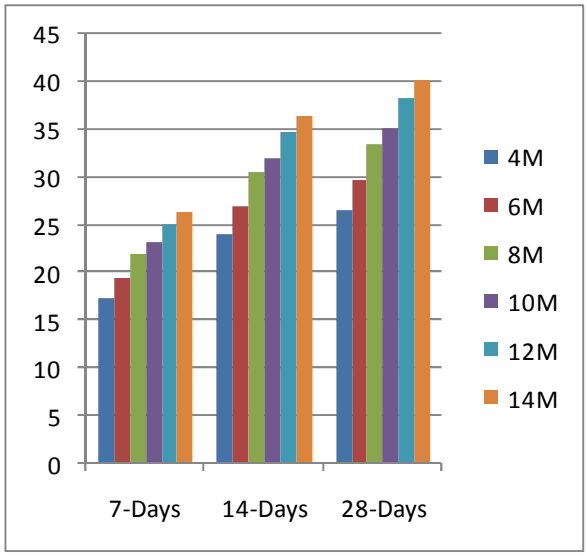
III. RELATED WORK

Preparation of Geo polymer Concrete Mixes:
Readiness of geo polymer cement is like that of bond cement. The fly cinder, Quarry tidy, coarse totals were blended in dry state. At that point include arranged blend arrangement of sodium hydroxide and sodium silicate alongside additional water in view of water-to-geo polymer folio proportion and blend completely for 3–4 min to give homogeneous blend.

It was found that the crisp fly fiery remains based geo polymer cement was thick, Cohesive and dull in shading. Subsequent to making the homogeneous blend, workability of Fresh geo polymer cement was measured by stream table mechanical assembly according to IS 5512-1983 and IS 1727-1967. Solid 3D shapes of side 150 mm& chambers of 300mm long&100 mm distance across are threw in three layers. Each layer is all around compacted by packing pole of width 16 mm. All cubes& chambers were place on table vibrator and vibrated for 2 min for legitimate compaction of cement. After compaction of cement, the top surface was leveled by utilizing trowel.

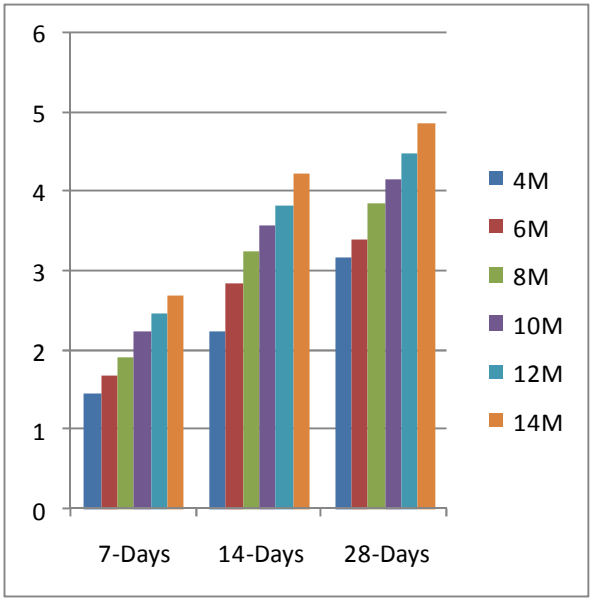
After 24 h of throwing, all blocks were de shaped and after that set in a stove for warm curing (The curing is at 600c for 24hrs). To maintain a strategic distance from the sudden variety in temperature, the solid 3D squares were permitted to chill off up to room temperature in a stove. Three solid shapes and barrels were thrown and tried for compressive strength& split elasticity for each curing period.

Graph for comparison of compressive strengths:



Graph represents the compressive strength for various concentrations.

Graph for comparison of split tensile strengths:



Graph represents the split tensile strength for various concentrations.

IV. CONCLUSION & FUTURE SCOPE

The quality of Geo polymer solid increments with the increments of convergences of soluble actuated arrangement.

The workability stream of Geo polymer solid increments with the increments of convergences of soluble actuated arrangement.

In the generation of geo polymer cover, the materials like fly powder (squander material from warm enterprises) and sodium hydroxide and sodium silicate (squander water from substance refineries) can be used.

With the utilization of Quarry tidy, the compressive quality is increments by 30%(approx.)

The geo polymer cement is less expensive, eco-accommodating, more noteworthy durability& having more noteworthy workability.

Future scope:

- Different percentages of quarry dust shall be used and the characteristics shall be studied.
- Different Grades of geo-polymer concrete shall be used and the characteristics shall be studied.

REFERENCES

[1] Davidovits J. Geopolymers: Man-Made Geosynthesis and the Resulting Development of Very Early High Strength Cement, Journal of Materials Education, 16 (1994) 91-139.

[2] Nath P, Sarker PK. Effect of GGBS on setting, workability and early strength properties of fly ash geopolymer concrete cured in ambient condition, Construction Building Materials, 66 (2014) 163-171.

[3] Deb P, Nath P, Sarker PK. The effects of ground granulated blast-furnace slag blending with fly ash and activator content on the workability and strength properties of geopolymer concrete cured at ambient temperature, Materials and Design, 62 (2014) 32-39.

[4] Mr. Gautam L et.al " Development of High Strength Geopolymer Concrete using Low Molarity NaOH"International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 www.ijert.org IJERTV4IS070243 Vol. 4 Issue 07, July-2015

[5] P. Chindaprasirt, T. Chareerat, S. Hatanaka, and T. Cao "High-Strength Geopolymer Using Fine High-Calcium Fly Ash"Journal of Materials in Civil Engineering, Vol. 23, No. 3, March 1, 2011. ©ASCE, ISSN 0899-1561/2011/3-264–270.

[6]. ParthaSarathiDeb,PradipNath, Prabirkumarsarker, "The Effects of GGBFS Blending with Flyash and Activator Content on the Workability and Strength Properties of Geopolymer Concrete Cured at Ambient Temperature ", Elsevier, Material and design,62(2014),page 32-39

[7] Sunil Kumar.R, DrV.Ramesh "Study On Behaviour Of GeoPolymer Concrete" : International Journal Of Civil And Structural Engineering Research Issn 2348-7607 (Online) Vol. 3, Issue 1, Pp: (384-388), Month: April 2015 - September 2015

[8] V.supraja , M.kantarao , "Experimental Study on Geopolymer Concrete Incorporating GGBS", International Journal of Electronics, Communications and Self Computing Science and Engineering (IJECSCSE), 2012 , ISSN : 2277-9477, Page 11-15

[9] V. Eswaraiah, G. Nagesh Kumar "Fibre Reinforced Eco Concrete"International Journal of Science and Research (IJSR) ISSN (Online): 2319- 7064.August 2014.

[10]. Anuar K.A, Ridzuan A.R.M., Ismail S., Universiti Teknologi MARA 40450 Shah Alam, Selangor, Malaysia, Strength Characteristic of Geopolymer Concrete - International Journal of Civil & Environmental Engineering, Vol: 11 No: 01 February2011.

[11]. S. Vaidya and etal- Experimental evaluation of Self cure Geopolymer concrete for mass pour application – World Coal Ash Conference,2011.

[12]. Raijiwala D.B.1 Patil H. S – Geopolymer Concrete- a Concrete of next decade, Journal of Engineering Research and Studies., March 2011.

[13]. Muhd Fadhil Nuruddin, Andri Kusbiantoro, Sobia Qazi, Nasir Shafiq- Compressive Strength and Interfacial Transition Zone Characteristic of Geopolymer Concrete with Different Cast In-Situ Curing Conditions, World Academy of Science, Engineering and Technology, 2011.

[14]. Douglas C. Comrie, John H. Paterson & Douglas J. Ritcey, D. Code Consulting Ltd, Boulevard East, Mississauga, Ontario - Applications of geopolymer technology to waste stabilization.

Authors:

Mrs. CHEVETI PRATHYUSHA is a student of LINGAYAS INSTITUTE OF MANAGEMENT AND TECHNOLOGY, MADALAVARIGUDEM, Vijayawada. She is presently pursuing her M.Tech degree from JNTU,Kakinada.

Mr. M.RICHARD FORD is presently working as Assistant professor in CIVIL Department, LINGAYAS INSTITUTE OF MANAGEMENT AND TECHNOLOGY, MADALAVARIGUDEM, Vijayawada.